PRESSURIZED LUBRICATION SYSTEM

BACKGROUND

A vast multitude of industrial operations require some type of cooling or lubricating system in order to keep machines and tools running smoothly. The present invention relates to a system which can be utilized wherever there is a need for supplying a liquid or a liquid mist to a given point such as a lubricating point, particularly from a common lubrication system.

In many operations and machines there is no need for a constant flow of liquid or of a liquid mist to a given lubrication point. Rather, an intermittent flow is desired. For example, in lubrication systems which are associated with industrial machinery, the activation of the lubrication system is usually controlled by the working cycle of the machine to be lubricated.

SUMMARY

In the present invention, pressurized air (or gas) is supplied to a container which holds both a quantity of liquid and a quantity of the air under pressure. The air is supplied to the container through a metering means such that the rate of flow of the air from the air supply means to the pressurized container can be regulated. Means are provided for allowing air to flow from the pressurized container to a lubrication point, such means including a valve for regulating the flow of the air. Means are also provided for allowing liquid to flow from said pressurized container to the lubrication point, such means also including a valve for regulating the flow of the liquid. Finally, there is a means for controlling both of said valves as a function of the air pressure in the pressurized container.

Thus the invention provides a lubricating system which is universal in application and which is not tied to the operation cycle of a single machine. Rather, the frequency of lubrication of the present system can be varied by adjusting the airflow metering valve and the means for controlling the valves on the air and lubricant lines which flow from the pressurized container to the lubrication point.

DRAWINGS

The above-mentioned advantages and other advantages of this invention can be seen by reference to the drawings wherein:

FIG. 1 is a schematic drawing of the overall pressurized lubrication system;

FIG. 2 is a sectional end elevation of the solenoid control valve means used in the system of FIG. 1;

FIG. 3 is an enlarged sectional side elevation of the valve portion of the valve means shown in FIG. 2; and

FIG. 4 is a fragmentary sectional overhead plan view on a reduced scale, taken through the plane IV—IV of FIG. 3.

PREFERRED EMBODIMENT

The basic components of the system of this invention include supply or source 10 of air under pressure, an air supply line 20 including a metering valve 21 and a check valve 22, a pressurized container 30, an outlet air line 40, an outlet line 41 for liquid or lubricant, a double valve means 50 for controlling the flow through lines 40 and 41, a pressure switch 60, and a metering valve manifold 70 having coaxial tubes 73 extending therefrom.

The air supply means 10 may generally be a central air compressor which supplies pressurized air for a number of purposes. While any suitable gas could be used in the system, compressed air is the most typical medium, and is convenient and readily available. Air supply line 20 connects the air supply means 10 to the container 30, to pressurize it. Metering valve 21 in line 20 is a pressure-regulating device of a conventional nature and should be adjustable to provide any desired rate of flow of air into the pressurized container 30 to maintain it at a desired pressure level. Check valve 22 in air supply line 20 prevents air from flowing from pressurized container 30 back to air source 10.

Pressurized container 30 may be any suitable container for holding a liquid lubricant 31 and air 32 under pressure. There should be a safety valve on this container and an inlet tube 33 or other such means for admitting the liquid 31. Inlet tube 33 extends into the container a predetermined distance to maintain a desired volume of lubricant therein, as well as a desired volume of compressed air above the lubricant. Extending out of the pressurized container 30 are an air line 40 and a lubricant line 41. Lubricant line 41 extends well below the level of liquid 31 in pressurized container 30, as for example by means of a sump tube 34 connected to the cover of the container and having an appropriate connection to lubricant line 41. Likewise, there is a shorter tube extending just inside the cover of the container with an appropriate connection to air line 40.

Lines 40 and 41 both lead to a solenoid-operated double valve means 50, which includes a valve block 51 (FIGS. 2, 3 and 4) having a pair of separate valve members 52 and 54 for controlling the flow through air line 40 and lubricant line 41, respectively, to their respective outward extensions 140 and 141, which connect to the aforementioned manifold 70, or a series of such manifolds. A description of valve 52 will suffice for both, since both are of an identical construction. Line 40 leads into the valve block 51 (FIGS. 3 and 4) and into the lower portion of a valve chamber 52*a* which is opened and closed by valve 52, while outlet 140 leads out of block 51 from the upper portion of chamber 52*a*. A spring 53 in the bottom of valve chamber 52*a* acts to force a valve plunger 152 upwardly, in conjunction with the upwardly directed force applied to such member by the pressure of the fluid which is controlled thereby. Plunger 152 has a resilient end 55 at its lower extremity which is flat on the bottom and of a larger diameter than the spring 53, and which lies in contact with the latter. End portion 55 has a conical top which slopes upwardly and inwardly at about 45° to the horizontal, and which seats in a conical bore 56. Valve 52 also includes an O-ring plunger seal 86 which prevents fluid from flowing out through the top of the valve member. Plunger 152 slides vertically inside a tubular sleeve insert 57 which includes O-ring seals 58 and 59 at its top and bottom portions, respectively, such that neither air nor lubricant can leak out of the valve through its top or out of the upper portion of the valve and into the lower portion thereof. The sleeve 57 generally rests snugly against the walls of the generally cylindrical bore or chamber 52*a*, but it has a reduced diameter about that portion which is laterally aligned with outlet line 140. Furthermore, there are several ports through the reduced diameter portion of the sleeve, such that outlet 140 communicates with the interior of the sleeve and with plunger 57. The lowermost extremity of the tubular sleeve forms the aforementioned conical seat 56 in which the resilient end 55 of plunger 152 seats to shut off flow through the valve chamber. As illustrated in FIG. 2 both valves 52 and 54 may be retained in place by a screw 49 which is screwed into block 51 and whose head extends over the edge of the sleeve inserts of both valves, thus holding them in place. A free actuating ball 48 is then placed on top of the plunger of each valve when the latter are to be solenoid or manually activated.

One preferred means for actuating valves 52 and 54 is seen by reference to FIG. 2. A ganging means including a circular plate 90 rests atop both of the balls 48 and has a post extending upwardly into a solenoid 100. Solenoid 100 includes a core 102, a winding 104 within the latter, an armature 106 encircled by winding 104, rubber core mount 108, and an outer housing 110. Armature 106 is I-shaped, and the horizontal portion thereof is outside of an above both winding 104 and core 102. Core 102 supports winding 104 and rests atop the rubber mounts 108. Solenoid housing 110 is mounted on top of valve block 51, and contacts the top of the core 102 to push the latter downwardly against the resilient mounts 108. There is a space defined between the top of housing 110 and winding core 102 which is sufficiently large to accommodate the horizontal portion of the T-shaped armature 106, and large